DOCUMENT RESUME

ED 254 413 SE 045 430

AUTHOR Koballa, Thomas R., Jr.
TITLE Preservice Teachers' Retention of Changed Attitudes toward Energy Conservation: Cognitive Response or Recall of Message Arguments.
PUB DATE 85
NOTE 22p.; Paper presented at the Annual Meeting of the National Association for Research in Science Teaching (58th, French Lick Springs, IN, April 15-18, 1985). Light type may affect legibility of some pages.
PUB TYPE Reports - Research/Technical (143) -- Speeches/Conference Papers (150)

EDRS PRICE MF01/PC01 Plus Postage.
DESCRIPTORS *Attitude Change; Communication (Thought Transfer); *Energy Conservation; Higher Education; *Persuasive Discourse; Preservice Teacher Education; *Retention (Psychology); Science Education; *Teacher Attitudes
IDENTIFIERS Science Education Research

ABSTRACT

This investigation attempted to determine if subjects' cognitive responses to a persuasive communication are more highly correlated with attitude change than the recall of arguments presented in the communication. Subjects (79 students enrolled in several sections of an elementary science methods course) were exposed to a systematically designed persuasive communication about energy conservation and then tested for their retention of the arguments presented in the communication and cognitive responses. Attitude change was found to be significantly correlated with cognitive responses elicited immediately following the persuasive communication and cognitive responses recalled 3 weeks later. No significant correlation was found between the recall of communication arguments and attitude change. The results offer a plausible explanation of the contradictory findings reported in the science education literature regarding the dissipation of attitudes changed using persuasive communication. (Author/JN)

****
* Reproductions supplied by EDRS are the best that can be made *
* from the original document. *
****

ED254413

U.S. DEPARTMENT OF EDUCATION
NATIONAL INSTITUTE OF EDUCATION
EDUCATIONAL RESOURCES INFORMATION
CENTER (ERIC)

✓ This document has been reproduced as received from the person or organization originating it.

☐ Minor changes have been made to improve reproduction quality.

• Points of view or opinions stated in this document do not necessarily represent official NIE position or policy.

Preservice Teachers' Retention of Changed Attitudes Toward Energy Conservation: Cognitive Response or Recall of Message Arguments

Thomas R. Koballa, Jr.
Science Education Center
The University of Texas at Austin
Austin, TX 78712

"PERMISSION TO REPRODUCE THIS MATERIAL HAS BEEN GRANTED BY

Thomas R. Koballa, Jr.

TO THE EDUCATIONAL RESOURCES INFORMATION CENTER (ERIC)."

SE 045 430

Preservice Teachers' Retention of Changed Attitudes Toward Energy Conservation: Cognitive Response or Recall of Message Arguments

Energy conservation has been and will again be an important part of the energy policy of the United States. While there is an impetus to develop renewable energy resources such as solar, wind, and geothermal power, equal efforts should be directed toward the conservation of nonrenewable reserves. Presently, profligate consumption is legitimized by the assumption of cheap and almost unlimited energy. However, as most people must be aware, this period of plentiful, relatively cheap energy cannot last much longer. Its ending will bring about considerable domestic repercussions. More efficient and economical use of energy must again become part of everyday life with individual contributions resulting in personal benefits in terms of reducing the impact of inevitable price increases and collectively in lowering the level of national consumption.

Three broad means are currently available to promote energy conservation: technical, economic, and social (Gaskell & Ellis, 1982). The technical means involve the design of buildings, appliances, and energy management systems. Pricing policies and taxation are among the economic means of promoting energy conservation. The social means by which energy conservation can be promoted include the use of persuasion, information, and community norms to change attitudes and behaviors.

While an effective conservation policy must include all means, it is only within the social context that teachers can make substantial contributions. Nevertheless, energy conser-

vation practices are not widely taught by elementary teachers. The development of appropriate attitudes toward energy conservation among elementary teachers is viewed as a way of facilitating the teaching of energy conservation practices (Glass, 1982; Lawrenz, 1984). The development of appropriate attitudes that facilitate the teaching of energy conservation practices is substantiated by the positive relationship between attitude and behavior well-documented in the social psychological literature (Ajzen & Fishbein, 1980; Liska, 1984).

Rationale

Found in the social psychological literature are two broad schools of thought on attitude modification, with each school subsuming numerous related theoretical models. Social influence, spawned from Kurt Lewin's field theory approach to social psychology, and persuasion, based on behaviorist learning theory, are the two schools of thought on attitude modification (Sahakian, 1982). Science educators, serious about investigating attitudes, should draw their theoretical support from this literature (see Zimbardo, Ebbesen, & Maslach, 1977).

Of the two, persuasion is the most fully developed and can be easily transferred into education (Shrigley, 1984). Much baseline data is needed about the people and groups that influence teachers' attitudes toward energy conservation and other science related constructs before attitude studies can be built on Lewin's social influence model. Also, a precedent for the use of persuasion in science education has been established. Shrigley's (1976, 1978) early research set the stage for the use of persua-

sion by collecting baseline data which describes the characteristics of a credible communicator and the components of a persuasive message used in developing a communication to change the attitudes of elementary teachers toward science.

Previous persuasion research in science education (Hassan & Shrigley, in press; Koballa, 1984; Koballa & Shrigley, 1983) has followed the theoretical account of the persistence of persuasion proposed by Hovland et al. (1949) and later refined by McGuire (1968, 1969). If attitude change was observed immediately following a communication, it was assumed to be the result of attention, comprehension, and acceptance of the arguments presented in the communication. Accordingly, attitude change was thought to persist to the extent that the arguments could be remembered. If most of the communication arguments were forgotten, then a return to the initial attitude would be expected. This model of persistence assumes a stringent relationship between the retention of specific arguments presented in the communication and attitude change.

Recently, it has been shown that the ability to learn the arguments presented in a communication is not as important in attitude change processes as how individuals cognitively respond to or elaborate upon the arguments (Cacioppo & Petty, 1980; Greenwald, 1968; Petty, Ostrom, & Brock, 1981). This cognitive response approach to persuasion emphasizes how people personally evaluate the arguments presented in the communication. Ultimately, it is the person's own cognitive responses to the communication that produce attitude change or resistance. If favorable

thoughts about the communication are generated, persuasion results; if counterarguments are produced, resistance results. Furthermore, the cognitive response approach to persuasion maintains that the amount of initial cognitive processing which occurs at the time of the persuasive communication is the critical determinant of the persistence of attitude change. The findings of several studies suggest that attitudes persist because the thoughts generated in response to the communication are remembered (Cacioppo & Petty, 1979; Insko, Lind, & LaTour, 1976; Petty & Cacioppo, 1979).

Purpose

The purpose of the investigation was to enhance the understanding of the cognitive response approach to persuasion within the milieu of science education. The relationships between changed attitudes, recall of a communication's arguments, and cognitive responses elicited and retained were examined. It was hypothesized that the effectiveness of a persuasive communication is related to the evaluative content of the cognitive responses that is elicited and retained, rather than the communication arguments recalled.

Method

Subjects and Design

Students (N=79) enrolled in several sections of an elementary science methods course at a large southwestern university participated as subjects in the investigation. Data from four subjects were not used in the final analysis: three subjects

failed to attend one or more of the three experimental sessions, and one subject did not complete all the experimental materials.

A correlational method was employed in the investigation to explore relationships between changed attitudes, recall of the communication's arguments, and cognitive responses elicited and retained. No attempt was made to predict attitude change scores from subjects' recall of the communication's arguments or cognitive responses.

Procedure

The investigation was introduced as part of a survey of preservice teacher attitudes toward energy conservation. The first experimental session consisted of administering the Likert-type attitude scale to all subjects. The second experimental session was conducted one week after the first. During this session, the persuasive communication was presented and subjects listed their cognitive responses and the communication arguments that they could recall. The second experimental session concluded with the readministration of the Likert-type attitude scale. The third experimental session was conducted three weeks after the second. Subjects listed the communication arguments and cognitive responses that they could recall during this session. The Likert-type attitude scale was again administered. That changed attitudes are presumed to be less susceptible to dissipation if the thoughts generated in response to the communication are remembered warranted assessing subjects' recall of cognitive responses and communication arguments and readministering the Likert-type attitude measure.

The materials used in the investigation are presented as follows: (a)attitude measure, (b)communication, (c)measure of cognitive responses, and (d)recall measures.

Attitude Measure. Pretest and posttest attitudes were measured using the twenty-one statement Attitude Toward Energy Conservation Scale, fully described elsewhere (Koballa, 1984d). Coefficient alpha values have been reported to range from 0.82 to 0.87. Previous studies using the Attitude Toward Energy Conservation Scale suggest it to be a valid measure of preservice teachers' attitudes toward energy conservation (Koballa, 1984b; Koballa, 1984c).

Communication. When attempting to persuade an audience knowledgeable about the topic of the communication, counterarguments can be refuted by acknowledging their existence and asserting that the supporting evidence strongly outweighs these arguments (Chu & Schramm ,1967). The two-sided communication used in this study presented both favorable and counterarguments concerning the importance of energy conservation to the future of all Americans and the immediate need for elementary teachers to incorporate energy conservation topics into their teaching. The communication was presented in 10 minutes and 31 seconds via videotape and is described fully elsewhere (see Koballa, 1984a).

Measure of Cognitive Responses. To record their cognitive responses to the communication's main arguments, subjects were provided with a series of seven boxes to list their thoughts or reactions. Subjects were given the following instructions concerning the recording of their cognitive responses after viewing

the videotaped communication:

> In an attempt to probe deeper into your feelings about energy conservation, a form has been constructed on which you can record your thoughts on making energy conservation a part of the science curriculum in grades K-6. Simply write down the first thought on the topic that comes to mind in the first box, the second thought that occurs to you in the second box, etc. Please put only one thought in a box. You might have thoughts all on one side of the issue or on the other, or a mixture of the two. Any of these is fine. Please state your thoughts as concisely as possible; a phrase is sufficient.
>
> You will have five minutes to write your thoughts. More boxes have been deliberatly constructed than you may need to ensure that everyone will have plenty of room to write their thoughts, so don't worry if you aren't able to fill every box. Just write down as many thoughts as occur to you on the topic in the allowed time.

The written cognitive responses were later scored using a scoring scheme similar to that employed by Love and Greenwald (1978). Cognitive responses identified as supportive of the teaching of energy conservation were given a score of +1. A score of -1 was given to cognitive responses not supportive of the teaching of energy conservation. Cognitive responses identified as unrelated to the teaching of energy conservation were given a score of 0. The following statements drawn from the subjects' report forms are representative of the three cognitive response categories:

> A small portion fo the school day should be devoted to

teaching kids how to conserve energy. (Positive)

We don't need to teach about energy conservation, alternative forms of energy will be discovered. (Negative)

Pollution should be studied as part of the elementary curriculum. (Unrelated)

To establish the reliability of the scoring scheme used by the investigator to score all cognitive responses, 30 cognitive responses written immediately following the communication were chosen at random and presented to a jury of two science educators. Following instructions, the science educators scored the cognitive responses independently. When compared to the investigator s scoring of the cognitive responses, the agreement percentages were 81 and 88. The mean agreement percentage of the jury was 84.5.

Recall Measures. Recall of the communication's main arguments and the subjects' cognitive responses was scored using a scoring scheme similar to that employed by Greenwald and Sakumura (1967). At the time of the third session, the subjects were asked to write as many of each as they could remember during two five-minute periods. Recall was scored using the following categories: 3=accurate reproduction (though not necessarily verbatim); 2=partially accurate reproduction; 1=recognizable but largely inaccurate reproduction; 0=no recognizable recall attempt.

To establish the reliability of the scoring scheme used by the investigator, the communication's arguments and cognitive responses recalled by 23 subjects were chosen at random and presented to a jury of 23 preservice elementary teachers. The

preservice teachers independently scores the cognitve responses recalled by comparing them with the cognitive responses elicited by the subjects three weeks earlier. When compared with the investigator's scoring of the cognitive responses recalled, the agreement percentages ranged from 71 to 98. The mean agreement percentage of the preservice teachers was 87.4.

Subjects' recall of the communication's arguments was assessed by preservice teachers independently comparing the arguments recalled immediately following the communication and three weeks later with a list of the main arguments presented in the communication. When the preservice teachers' scoring of the recall of the communication's arguments was compared to that of the investigator, the agreement percentages ranged from 78 to 97. The mean agreement percentage of the preservice teachers was 93.6.

Results

In line with the purpose of the investigation, no control group was employed to verify the effectiveness of the persuasive communication in changing the attitudes of the subjects toward energy conservation. Previous investigations, however, in which control groups were employed, found the persuasive communication used in this investigation to be effective in significantly changing the attitudes of preservice elementary teachers toward energy conservation (Koballa, 1984b; Koballa, 1984c). In the absence of any factors that may have compromised its effectiveness, it may be inferred that the changed attitudes were a result of the persuasive communication. Mean pretest, posttest, and

delayed posttest scores for the Likert-type attitude measure are presented in Table 1.

Cognitive responses. Every subject wrote cognitive responses to the communication. The mean number of cognitive responses written per subject was 4.7. Favorable responses were most frequent (89%) followed by neutral responses (6%), and a smaller number of unfavorable responses (5%). Each subject was given a cognitive response score, computed as the number of favorable thoughts minus the number of unfavorable thoughts. Scores ranged from -2 to 7. The first row of Table 2 contains the partial correlations, with the pretest effects removed, of the cognitive response scores with the Likert-type posttest measures. The resulting partial correlations indicate that the cognitive response score was significantly correlated ($p < 0.05$) with the Likert-type posttest immediately and three weeks following the communication.

Recall of communication arguments. Recall of communication arguments was measured immediately after the communication in the second session and during the third session, three weeks later. Since the communication arguments advocated teaching energy conservation practices and refuted counterarguments for not doing so, the recall score for content was the summed number of favorable arguments recalled. (The number of favorable arguments recalled was arrived at by using the four category scoring scheme previously described.) Correlations of the communication arguments recalled with the posttest attitude measure for both the immediate and delayed posttests, with the effects of pretest scores partialled out, are presented in the third and fourth rows

of Table 2.

Recall of cognitive responses. Recall of cognitive responses was measured during the third session. Since the cognitive responses were not uniformly supportive of the importance of energy conservation and the immediate need for teachers to teach energy conservation practices to elementary school students, the cognitive response recall was computed by subtracting the number of recalled negative responses from the number of recalled positive responses. (The number of cognitive responses recalled was arrived at by using the four category scoring scheme previously described.) The correlation of the cognitive responses recalled with the posttest attitude measure at the time of the third session, with the effects of pretest scores partialled out, is presented in the second row of Table 2.

Conclusion

The findings suggest that cognitive responses and the recall of cognitive responses are significantly related to attitude change. Communication recall, however, is not significnatly related to attitude change. The finding that communication recall is not significantly related to attitude change supports an increasing body of social psychological data indicating that attitude change is not dependent upon the learning of communication content (Cacioppo & Petty, 1980; Love & Greenwald, 1978; Petty, 1977).

Discussion

Greenwald (1968) has proposed that attitude change consists

of the remembering of communication-elicited cognitive responses to the attitude object presented in the communication. This theory specifies that communication-elicited cognitive responses moderate attitude change. In the present investigation, attitude change was found to be significantly correlated with the elicitation and recall of cognitive responses, while there was no significant correlation between attitude change and recall of message content. These findings are consistent with Greenwald's (1968) cognitive response hypothesis. Furthermore, the findings suggest a plausible explanation for the contradictory findings reported in the science education literature regarding the dissipation rate of attitudes changed using persuasive communications (Koballa, 1984b; Koballa & Shrigley, 1983; Hassan & Shrigley, in press). The cognitive response literature reports that initial cognitive processing and the ability to recall the thoughts generated are the critical determinants of the persistence of attitude change. Being unaware of the subjects' initial cognitive responses and their ability to recall these responses, an investigator is unable to assess the extent to which cognitive processing has occurred, if at all. The contradictory findings, therefore, are likely to be the result of variability in the amount of cognitive processing among subjects.

The data collected in the present correlational design are necessary, but not sufficient, to establish a definitive relationship between cognitive response and attitude change in the milieu of science education. Further experimental support is needed. In addition to the present type of correlational results, such support requires: (a) research in which systematical-

ly designed persuasive communications elicit different cognitive responses leading to differences in attitude change, and (b) research demonstrating that cognitive responses elicited by persuasive communications are responsible for a significant portion of the cognitive components of subjects' postcommunication attitudes. Both of these types of results have already been ootained by social psychologists, but only in a laboratory environment using contrived issues.

Social psychologists have found it possible to induce subjects to elicit cognitive responses about the topics of persuasive communications. They have done this by making the communications of high personal value or high consequence (e.g., that seniors be required to take a comprehensive exam in their declared major as a prerequisite to college graduation). In the real world, however, the task of making attitude objects like energy conservation or teaching science of high personal importance or high consequence to elementary teachers is much more difficult. Reliance on the attractiveness or appeal of the communicator or rewards for agreeing with the position advocated by the communication, be they social acceptance or something more tangible, must also be considered when constructing persuasive communications. Petty & Cacioppo's (1980) description of the peripheral route to attitude change affirms the influence that such factors have on persuasive attempts to change attitudes.

The present findings, taken together with those of another related study (Koballa, 1984c), are consistent with the hypothesis that cognitive responses to persuasion moderate attitude

change. Recall of communication content, on the other hand, does not appear to be directly related to attitude change. The present investigation appears to be a positive step toward identifying the factors that play a significant role in changing the attitudes of teachers toward energy conservation and other constructs of interest to science educators.

References

Ajzen, I., & Fishbein, M. (1980). Understanding attitudes and predicting social behavior. Englewood Cliffs, NJ: Prentice-Hall Publishing Company.

Cacioppo, J. T., & Petty, R. E. (1979). Effects of message repetition and position on cognitive responses, recall, and persuasion. Journal of Personality and Social Psychology, 37, 97-109.

Cacioppo, J. T., & Petty, R. E. (1980). Persuasiveness of communications is affected by exposure frequency and message quality: A theoretical and empirical analysis of persisting attitude change. In J. H. Leigh, & C. R. Martin (Eds.), Current issues and research in advertising (pp. 97-122). Ann Arbor, MI: University of Michigan.

Chu, G. C., & Schramm, W. (1967). Learning from television: What the research says. Washington, DC: National Association of Educational Broadcasters.

Gaskell, G., & Ellis, P. (1982). Energy conservation: A psychological perspective on a multidisciplinary phenomenon. In P. Stringer (Ed.) Confronting social issues, Vol. 1. London: Academic Press.

Glass, L. W. (1982). An inservice energy education program for elementary school teachers. Journal of Research in Science Teaching, 21(5), 469-474.

Greeenwald, A. G. (1968). Cognitive learning, cognitive response to persuasion and attitude change. In A. G. Greenwald, T. C. Brock, & T. M. Ostrom (Eds.), Psychological foundations of attitudes. New York: Academic Press.

Greenwald, A. G., & Sakumura, J. S. (1967). Attitudes and selective learning: Where are the phenomena of yesteryear? Journal of Personality and Social Psychology, 7, 387-397.

Hassan, A. M. A., & Shrigley, R. L. (in press). The effect of persuasion upon the attitudes of science teachers. Science Education.

Hovland, C., Lumsdaine, A. A., & Sheffield, F. D. (1949). Experiments on mass communication. Princeton: Princeton University Press.

Insko, C. A., Lind, E. A., & LaTour, S. (1976). Persuasion, recall, and thoughts. Representative Research in Social Psychology, 7, 66-78.

Koballa, T. R., Jr. (1984a). A validation process for designing one-sided and two-sided communications for use in persuading teachers of the need to teach energy conservation to children. Science Education, 68, 95-104.

Koballa, T. R., Jr. (1984b). Changing attitudes toward energy conservation: The effect of developmental advancement on the salience of one-sided and two-sided persuasive communications. Journal of Research and Science Teaching, 21(6), 659-668.

Koballa, T. R., Jr. (1984c). Self-generated thought as a result of a persuasive message and its implications on the attitudes toward energy conservation of preservice elementary teachers. Paper presented at the 57th annual National Association for Research in Science Teaching Conference, New

Orleans, LA.

Koballa, T. R., Jr. (1986). Designing a Likert-type scale to assess attitudes toward energy conservation: A nine step process. Journal of Research in Science Teaching, 21(7), 709-723.

Koballa, T. R., Jr., & Shrigley, R. L. (1983). Credibility and persuasion: A sociopsychological approach to changing the attitudes toward energy conservation of preservice science teachers. Journal of Research in Science teaching, 20, 683-696.

Lawrenz, F. P. (1984). An evaluation of the effect of two different lenghts of of inservice training on teacher attitudes. Journal of Research in Science Teaching, 21(5), 497-506.

Liska, A. E. (1984). A critical examination of the causal structure of the Fishbein/Ajzen attitude-behavior model. Social Psychology Quarterly, 47(1), 61-74.

Love, R. E., & Greenwald, A. C. (1978). Cognitive responses to persuasion as mediators of opinion change. Journal of Social Psychology, 104, 231-241.

McGuire, W. J. (1969). The nature of attitudes and attitude change. In G. Lindzey, & E. Aronson (Eds.), The handbook of social psychology (pp. 136-314). Reading, MA: Addison-Wesley.

McGuire, W. J. (1968). Personality and susceptibility to social influence. In E. F. Borgatta, & W. W. Lambert (Eds.), Handbook of personality theory and research. Chicago: Rand-McNally.

Petty, R. E. (1977). The importance of cognitive responses in persuasion. Advance in Consumer Research, 4, 357-362.

Petty, R. E., & Cacioppo, J. T. (1979). Issue involvement can increase or decrease persuasion by enhancing message-relevant cognitive responses. Journal of Personality and Social Psychology, 37, 1915-1926.

Petty, R. E., Ostrom, G. L., & Brock, T. C. (1981). Cognitive responses in persuasion. Hillsdale, NJ: Erlbaum.

Sahakian, W. S. (1982). History and systems of social psychology. Washington, DC: Hemisphere Publishing Corporation.

Shrigley, R. L. (1984). The attitude concept and science teaching. Science Education, 67(4), 425-442.

Shrigley, R. L. (1978). The persuasive communication model: A theoretical approach to attitude change in science education. Journal of Research in Science Teaching, 15, 335-341.

Shrigley, R. L. (1976). Credibility of the elementary science methods instructor as perceived by students: A model for attitude modification. Journal of Research in Science Teaching, 13, 449-453.

Zimbardo, P. G., Ebbesen, E. B., & Maslach, C. (1977). Influencing attitudes and changing behavior. Reading, MA: Addison-Wesley.

Table 1

Pretest, Postest, and Delayed Postest Attitude Scores

	Attitude Scores		
	Pretest	Posttest	Delayed Posttest
Mean	58.9	64.3	63.6
SD	7.5	7.9	7.8

Table 2

Partial Correlations of Cognitive Responses and Argument Recall with Immediate and Delayed Postest Attitude

	Attitude Postest	
	Immediate	Delayed
Cognitive responses during the communication	.36*	.34*
Recall of cognitive responses		.29*
Recall of communication arguments		
immediate	.11	
delayed		-.17

* Significant at the .05 level, two-tailed